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DRINKING WATER SURVEILLANCE PROGRAM

CASSELMAN WATER TREATMENT PLANT

ANNUAL REPORT 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

CASSELMAN WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Casselman water treatment plant is a conventional treatment plant which treats water from the South Nation River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, pH adjustment, taste and odour control and disinfection. This plant has a rated capacity of 0.69 x 1000 m^3/day. The Casselman water treatment plant serves a population of approximately 2,200.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Casselman water treatment plant, for the sample year 1990, produced acceptable quality water and this was maintained in the distribution system.

The presence of elevated lead and copper levels in the standing samples at one distribution system site indicates that household taps should be flushed before water is used for consumption.

The number of pesticides and other parameters which were detected at the Casselman water treatment plant, indicates that this raw water source is adversely affected by agricultural activity.

TABLE A

ORINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	36	32	88	12	7	58	11	5	45	11	10	90
CHEMISTRY (FLD)	36	36	100	71	71	100	144	141	97	144	141	97
CHEMISTRY (LAB)	264	249	94	263	216	82	456	422	92	456	424	92
METALS	288	131	45	287	122	42	552	293	53	552	288	52
CHLOROAROMATICS	168	0	0	154	0	0	154	0	0	154	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	183	0	0	166	0	0	17	0	0	17	0	0
PESTICIDES & PCB	409	4	0	375	3	0	233	0	0	233	0	0
PHENOLICS	12	5	41	12	6	50	.	.	.	.	.	.
SPECIFIC PESTICIDES	64	0	0	63	0	0	11	0	0	11	0	0
VOLATILES	319	5	1	348	40	11	348	41	11	348	42	12
TOTAL	1791	462		1763	465		1926	902		1926	905	

DRINKING WATER SURVEILLANCE PROGRAM

CASSELMAN WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Casselman water treatment plant in April of 1989. A previous annual report was published for 1989.

PLANT DESCRIPTION

The Casselman water treatment plant is a conventional treatment plant which treats water from the South Nation River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, pH adjustment, taste and odour control and disinfection. This plant has a rated capacity of 0.69 x 1000 m^3/day. The Casselman water treatment plant serves a population of approximately 2,200.

The sample day flows ranged from 0.66 x 1000 m^3/day to 0.86 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing

samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution system main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count, which may indicate some deterioration in water quality if the guideline of 500 counts/mL is exceeded.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 2 of 24 distributed water samples with a maximum reported value of 1.700 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 15 of 36 treated and distributed water samples with a maximum reported value of 24.0°C.

CHEMISTRY (LAB)

Calcium exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 100 mg/L in 3 of 36 treated and distributed water samples with a maximum reported value of 105.3 mg/L.

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 Hazen units (HZU) in all 36 treated and distributed water samples with a maximum reported value of 14.0 HZU.

Dissolved organic carbon exceeded the ODWO Maximum Desirable Concentration of 5.0 mg/L in 27 of 36 treated and distributed water samples with a maximum reported value of 8.9 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the EEC Aesthetic Guideline Level of 400 umho/cm in all 36 treated and distributed water samples with a maximum reported value of 935.0 umho/cm.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in all 36 treated and distributed water samples with a maximum reported value of 413.7 mg/L.

Magnesium exceeded the EEC Aesthetic Guideline Level of 30 mg/L in 3 of 36 treated and distributed water samples with a maximum reported value of 36.6 mg/L.

Total ammonium exceeded the EEC Aesthetic Guideline Level of 0.05 mg/L in 11 of 36 treated and distributed water samples with a maximum reported value of 0.23 mg/L. The EEC also has a Maximum Acceptable Concentration for ammonium of 0.5 mg/L which is an indicator for potential sewage pollution. The Maximum Acceptable Concentration was not exceeded. Elevated ammonium levels which occurred between February and April, the spring snow melt and runoff period, may be attributed to agricultural activity.

Turbidity is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO Maximum Acceptable Concentration for turbidity is 1.0 Formazin Turbidity Units (FTU).

Laboratory turbidity exceeded the Maximum Acceptable Concentration in 2 of 12 treated water samples with a maximum reported value of 1.6 FTU but, results were not confirmed by the more reliable corresponding field turbidity results.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 20 of 36 treated and distributed water samples with a maximum reported value of 450.0 ug/L.

The presence of elevated lead and copper levels in the standing samples at one distribution system site indicates that household taps should be flushed before water is used for consumption.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that 2,4,6-trichlorophenol was detected at a trace level in 1 of 2 treated water samples analyzed.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that one parameter was detected at trace levels in one treated and one distributed water sample.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

Atrazine was found at positive levels in 3 of the 11 treated and distributed water samples analysed. The maximum observed level was 920.0 ng/L. This was below the ODWO Interim Maximum Acceptable Concentration of 60,000 ng/L.

Other pesticides including endosulfan, desethyl, atrazine and simazine were detected at trace levels in some treated water samples.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water.

Phenolics exceeded the ODWO Aesthetic or Recommended Operational Guideline of 2 ug/L in 2 of 12 treated water samples with a maximum reported value of 3.8 ug/L.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Toluene was found at positive levels in 4 of the 36 treated and distributed water samples analysed. The maximum observed level was 0.6 ug/L. This was below the ODWO Aesthetic Objective of 24 ug/L.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in 35 of the 36 treated and distributed water samples analyzed. The maximum observed level was 245.8 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

Trace levels of THMs were detected in 6 raw water samples indicating backmixing of chlorine with raw water at the raw water sample location.

It should be noted that levels of THMs in treated water from February to April were lower than expected for this raw water source. Much of the chlorine, used as a disinfectant in the treatment process, was being converted from a free chlorine residual to a combined chlorine residual by the high natural ammonia levels in the river. This in turn, inhibited the formation of THMs because there was not enough free chlorine to react with the THM precursors. This should be investigated further.

CONCLUSIONS

The Casselman water treatment plant, for the sample year 1990, produced acceptable quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

The presence of elevated lead and copper levels in the standing samples at one distribution system site indicates that household taps should be flushed before water is used for consumption.

The number of pesticides and other parameters which were detected at the Casselman water treatment plant indicates that this raw water source is adversely affected by agricultural activity.

The results are similar to those found in 1989.

FIGURE 1

CASSELMAN WTP

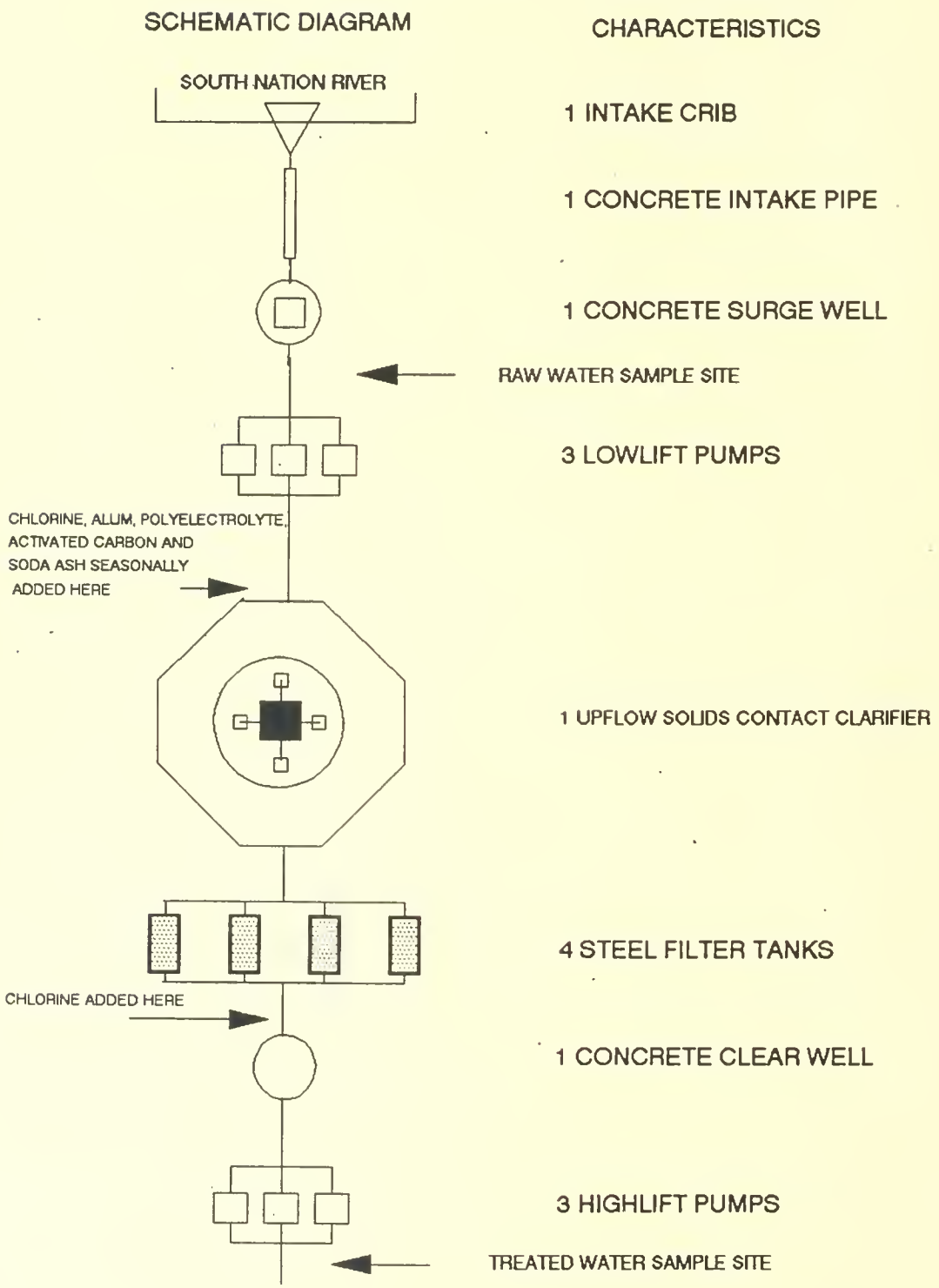

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 210001219
PLANT NAME: CASSELMAN WTP

DISTRICT: CORNWALL
REGION: SOUTHEAST
DISTRICT OFFICER: MR. M HOLLYN

UTM #: 184924005017500

PLANT SUPERINTENDENT: CLAUDE LEVESQUE

ADDRESS: 1 LAVAL STREET
CASSELMAN,ONTARIO
K08 1M0
(613-764-5678)

MUNICIPALITY: CASSELMAN
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	3.180	(X 1000 M3/DAY)
RATED CAPACITY:	.690	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
CASSELMAN	2,200

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
TOTAL CHLORINE RESIDUAL	TREATED WATER	CONTINUOUS
PH	RAW WATER	DAILY
	TREATED WATER	DAILY
TEMPERATURE	RAW WATER	DAILY
	TREATED WATER	DAILY
TURBIDITY	AFTER FILTERS	CONTINUOUS
COLOUR	RAW WATER	DAILY
	TREATED WATER	DAILY
ALKALINITY	RAW WATER	DAILY
	TREATED WATER	DAILY

TABLE 3
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL (MG/L)						
			TASTE & ODOUR	PRE-CHLORINATION	COAGULATION	INITIAL PH ADJUSTMENT	COAGULATION AID	POST PH ADJUSTMENT	POST CHLORINATION
			ACTIVATED CARBON	CHLORINE	ALUM LIQUID	CALCIUM HYDROXIDE	POLYELECTROLYTE	SODIUM CARBONATE	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)	POWDER						
JAN 03	3.00	.713	2.00	1.40	81.80		1.15		2.81
FEB 06	3.00	.761	2.00	1.31	85.20		.71	10.00	1.31
MAR 06	3.00	.736	2.00	1.36	88.00		.73	10.00	1.36
APR 03	3.00	.863	3.00	1.16	105.10	1.00	1.34		1.16
MAY 08	3.00	.000	3.00	2.53	90.20		1.37	1.00	2.53
JUN 05	3.00	.832	2.50	3.61	109.30	1.00	1.36		3.61
JUL 04	3.00	.844	2.00	5.95	100.30	.50	1.77		2.38
AUG 07	3.00	.765	2.00	7.84	118.60	.50	1.52		1.31
SEP 05	3.00	.866	2.00	9.26	112.20	1.00	1.57		4.68
OCT 02	3.00	.836	2.00	9.57	100.80	1.50	1.46		2.39
NOV 06	3.00	.660	2.00	3.03	108.00	1.00	1.55		1.52
DEC 04	3.00	.669	2.00	2.99	96.90	1.00	1.63		1.49

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	12	12	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	12	7	0	11	5	0	11	10	0
TOTAL COLIFORM MF	12	8	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	12	12	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	36	32	0	12	7	0	11	5	0	11	10	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	12	12	0	24	24	0	24	24	0
FLD CHLORINE FREE	.	.	.	11	11	0	24	21	0	24	21	0
FLD CHLORINE (TOTAL)	.	.	.	12	12	0	24	24	0	24	24	0
FLD PH	12	12	0	12	12	0	24	24	0	24	24	0
FLD TEMPERATURE	12	12	0	12	12	0	24	24	0	24	24	0
FLD TURBIDITY	12	12	0	12	12	0	24	24	0	24	24	0
*TOTAL SCAN CHEMISTRY (FLD)	36	36	0	71	71	0	144	141	0	144	141	0
CHEMISTRY (LAB)												
ALKALINITY	12	12	0	12	12	0	24	24	0	24	24	0
CALCIUM	12	12	0	12	12	0	24	24	0	24	24	0
CYANIDE	12	0	0	11	0	0	.	.	.	.	.	.
CHLORIDE	12	12	0	12	12	0	24	24	0	24	24	0
COLOUR	12	12	0	12	12	0	24	24	0	24	24	0
CONDUCTIVITY	12	12	0	12	12	0	24	24	0	24	24	0
DISS ORG CARBON	12	12	0	12	12	0	24	24	0	24	24	0
FLUORIDE	12	12	0	12	9	3	24	18	6	24	18	6
HARDNESS	12	12	0	12	12	0	24	24	0	24	24	0
IONCAL	12	12	0	12	12	0	24	24	0	24	24	0
LANGELIERS INDEX	12	12	0	12	12	0	24	24	0	24	24	0
MAGNESIUM	12	12	0	12	12	0	24	24	0	24	24	0
SODIUM	12	12	0	12	12	0	24	24	0	24	24	0
AMMONIUM TOTAL	12	10	1	12	6	2	24	13	5	24	15	5
NITRITE	12	11	1	12	3	9	24	7	17	24	8	16
TOTAL NITRATES	12	12	0	12	12	0	24	24	0	24	24	0
NITROGEN TOT KJELD	12	12	0	12	12	0	24	24	0	24	24	0
PH	12	12	0	12	12	0	24	24	0	24	24	0
PHOSPHORUS FIL REACT	12	12	0	12	2	8	.	.	.	.	.	.
PHOSPHORUS TOTAL	12	12	0	12	4	8	.	.	.	.	.	.
SULPHATE	12	12	0	12	12	0	24	24	0	24	24	0
TURBIDITY	12	12	0	12	12	0	24	24	0	24	23	1
*TOTAL SCAN CHEMISTRY (LAB)	264	249	2	263	216	30	456	422	28	456	424	28

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	12	0	0	12	0	0	24	0	0	24	0	0
ALUMINUM	12	11	1	12	12	0	24	24	0	24	24	0
ARSENIC	12	1	9	12	0	7	24	0	15	24	0	15
BARIUM	12	12	0	12	12	0	24	24	0	24	24	0
BORON	12	11	1	12	12	0	24	23	1	24	24	0
BERYLLIUM	12	0	4	12	0	4	24	0	7	24	0	5
CADMIUM	12	0	3	12	0	5	24	0	8	24	0	11
COBALT	12	0	11	12	0	11	24	0	23	24	0	24
CHROMIUM	12	1	11	12	0	10	24	2	18	24	2	16
COPPER	12	0	12	12	0	12	24	23	1	24	24	0
IRON	12	11	1	12	0	7	24	0	8	24	0	20
MERCURY	12	0	1	11	0	3	.	.	.	.	.	.
MANGANESE	12	11	1	12	12	0	24	24	0	24	24	0
MOLYBDENUM	12	12	0	12	12	0	24	24	0	24	24	0
NICKEL	12	1	3	12	1	6	24	5	11	24	10	8
LEAD	12	1	10	12	4	8	24	21	3	24	17	7
ANTIMONY	12	0	12	12	1	11	24	13	11	24	5	19
SELENIUM	12	0	6	12	0	7	24	0	16	24	0	14
STRONTIUM	12	12	0	12	12	0	24	24	0	24	24	0
TITANIUM	12	12	0	12	11	1	24	22	2	24	22	2
THALLIUM	12	0	0	12	0	0	24	0	1	24	0	0
URANIUM	12	12	0	12	9	3	24	16	8	24	16	8
VANADIUM	12	12	0	12	12	0	24	24	0	24	24	0
ZINC	12	11	1	12	12	0	24	24	0	24	24	0
*TOTAL SCAN METALS	288	131	87	287	122	95	552	293	133	552	288	149
*TOTAL GROUP INORGANIC & PHYSICAL	588	416	89	621	409	125	1152	856	161	1152	853	177
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	12	0	0	11	0	0	11	0	0	11	0	0
123 TRICHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
1234 T-CHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
1235 T-CHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
124 TRICHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
1245 T-CHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
135 TRICHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
HCB	12	0	0	11	0	0	11	0	0	11	0	0
HEXACHLOROETHANE	12	0	0	11	0	1	11	0	1	11	0	1
OCTACHLOROSTYRENE	12	0	0	11	0	0	11	0	0	11	0	0
PENTACHLOROBENZENE	12	0	0	11	0	0	11	0	0	11	0	0
236 TRICHLOROTOLUENE	12	0	0	11	0	0	11	0	0	11	0	0
245 TRICHLOROTOLUENE	12	0	0	11	0	0	11	0	0	11	0	0
26A TRICHLOROTOLUENE	12	0	0	11	0	0	11	0	0	11	0	0
*TOTAL SCAN CHLOROAROMATICS	168	0	0	154	0	1	154	0	1	154	0	1

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROPHENOLS												
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	1	.	.	.	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	1	0	0	0	0	0	0
PAH												
PHENANTHRENE	11	0	0	10	0	1	1	0	0	1	0	1
ANTHRACENE	10	0	0	9	0	0	1	0	0	1	0	0
FLUORANTHENE	11	0	0	10	0	0	1	0	0	1	0	0
PYRENE	11	0	0	10	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	11	0	0	10	0	0	1	0	0	1	0	0
CHRYSENE	11	0	0	10	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	9	0	0	8	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	11	0	0	10	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	11	0	0	10	0	0	1	0	0	1	0	0
PERYLENE	11	0	0	10	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	11	0	0	10	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	10	0	0	9	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	11	0	0	10	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	11	0	0	10	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	11	0	0	10	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	11	0	0	10	0	0	1	0	0	1	0	0
CORONENE	11	0	0	10	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	183	0	0	166	0	1	17	0	0	17	0	1
PESTICIDES & PCB												
ALDRIN	12	0	0	11	0	0	11	0	0	11	0	0
ALPHA BHC	12	0	0	11	0	2	11	0	0	11	0	1
BETA BHC	12	0	0	11	0	0	11	0	0	11	0	0
LINDANE	12	0	0	11	0	0	11	0	0	11	0	0
ALPHA CHLORDANE	12	0	0	11	0	0	11	0	0	11	0	0
GAMMA CHLORDANE	12	0	0	11	0	0	11	0	0	11	0	0
DIELDRIN	12	0	0	11	0	0	11	0	0	11	0	0
METHOXYCHLOR	12	0	0	11	0	0	11	0	0	11	0	0
ENDOSULFAN 1	12	0	1	11	0	1	11	0	1	11	0	1
ENDOSULFAN II	12	0	0	11	0	0	11	0	0	11	0	0
ENDRIN	12	0	0	11	0	0	11	0	0	11	0	0
ENDOSULFAN SULPHATE	12	0	0	11	0	0	11	0	0	11	0	0
HEPTACHLOR EPOXIDE	12	0	0	11	0	0	11	0	0	11	0	0
HEPTACHLOR	12	0	0	11	0	0	11	0	0	11	0	0
MIREX	12	0	0	11	0	0	11	0	0	11	0	0
OXYCHLORDANE	12	0	0	11	0	0	11	0	0	11	0	0
OPDDT	12	0	0	11	0	0	11	0	0	11	0	0
PCB	12	0	0	11	0	0	11	0	0	11	0	0
DDD	12	0	0	11	0	0	11	0	0	11	0	0
PPDDE	12	0	0	11	0	0	11	0	0	11	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDOT	12	0	0	11	0	0	11	0	0	11	0	0
AMETRINE	12	0	0	11	0	0	.	.	.	.	.	.
ATRAZINE	12	4	2	11	3	1	.	.	.	.	.	.
ATRATONE	12	0	0	11	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	12	0	0	11	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	12	0	3	11	0	0	.	.	.	.	.	.
D-ETHYL SIMAZINE	11	0	0	10	0	0	.	.	.	.	.	.
PROMETONE	12	0	0	11	0	0	.	.	.	.	.	.
PROPAZINE	12	0	0	11	0	0	.	.	.	.	.	.
PROMETRYNE	12	0	0	11	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	12	0	0	11	0	0	.	.	.	.	.	.
SIMAZINE	12	0	1	11	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	12	0	0	11	0	0	.	.	.	.	.	.
METOLACHLOR	12	0	0	11	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	2	0	0	2	0	0	2	0	0	2	0	0
*TOTAL SCAN PESTICIDES & PCB	409	4	7	375	3	4	233	0	1	233	0	2
PHENOLICS												
PHENOLICS	12	5	4	12	6	2	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	12	5	4	12	6	2	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	12	0	0	11	0	0	11	0	0	11	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.	.	.	.
ETHION	2	0	0	2	0	0	.	.	.	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
PHORATE	2	0	0	2	0	0	.	.	.	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	64	0	0	63	0	0	11	0	0	11	0	0
VOLATILES												
BENZENE	11	0	2	12	0	6	12	0	5	12	0	7
TOLUENE	11	0	2	12	1	10	12	1	10	12	2	10
ETHYLBENZENE	11	0	3	12	0	11	12	0	10	12	0	11
P-XYLENE	11	0	0	12	0	0	12	0	0	12	0	0
M-XYLENE	11	0	2	12	0	5	12	0	5	12	0	4
O-XYLENE	11	0	2	12	0	6	12	0	5	12	0	4
STYRENE	11	0	2	12	0	9	12	0	9	12	0	9
1,1 DICHLOROETHYLENE	11	0	0	12	0	0	12	0	0	12	0	0
METHYLENE CHLORIDE	11	0	0	12	0	0	12	0	0	12	0	0
T1,2DICHLOROETHYLENE	11	0	0	12	0	0	12	0	0	12	0	0
1,1 DICHLOROETHANE	11	0	0	12	0	0	12	0	0	12	0	0
CHLOROFORM	11	5	5	12	12	0	12	12	0	12	12	0
111, TRICHLOROETHANE	11	0	2	12	0	1	12	0	1	12	0	3
1,2 DICHLOROETHANE	11	0	0	12	0	0	12	0	0	12	0	0
CARBON TETRACHLORIDE	11	0	0	12	0	0	12	0	0	12	0	0
1,2 DICHLOROPROPANE	11	0	0	12	0	0	12	0	0	12	0	0
TRICHLOROETHYLENE	11	0	1	12	0	0	12	0	0	12	0	0
DICHLOROBROMOMETHANE	11	0	8	12	12	0	12	12	0	12	12	0
112 TRICHLOROETHANE	11	0	0	12	0	0	12	0	0	12	0	0
CHLORODIBROMOMETHANE	11	0	0	12	4	8	12	4	8	12	4	8
T-CHLOROETHYLENE	11	0	1	12	0	0	12	0	0	12	0	0
BROMOFORM	11	0	0	12	0	1	12	0	1	12	0	1
1122 T-CHLOROETHANE	11	0	0	12	0	0	12	0	0	12	0	0
CHLOROBENZENE	11	0	0	12	0	0	12	0	0	12	0	0
1,4 DICHLOROBENZENE	11	0	0	12	0	0	12	0	0	12	0	0
1,3 DICHLOROBENZENE	11	0	0	12	0	0	12	0	0	12	0	0
1,2 DICHLOROBENZENE	11	0	0	12	0	0	12	0	0	12	0	0
ETHLYENE DIBROMIDE	11	0	0	12	0	0	12	0	0	12	0	0
TOTL TRIHALOMETHANES	11	0	6	12	11	0	12	12	0	12	12	0
*TOTAL SCAN VOLATILES	319	5	36	348	40	57	348	41	54	348	42	57
*TOTAL GROUP ORGANIC	1167	14	47	1130	49	66	763	41	56	763	42	61

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminate Interference
XP	Positive After X Number Of Hours
T#	(T06) Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)		
JAN	36	.	.	.	.	.
FEB	92	.	.	.	.	.
MAR	108	.	.	.	.	.
APR	356	.	.	.	.	.
MAY	172	.	.	.	.	.
JUN	32	.	.	.	.	.
JUL	24	.	.	.	.	.
AUG	288	.	.	.	.	.
SEP	4	.	.	.	.	.
OCT	600 >	.	.	.	.	.
NOV	176	.	.	.	.	.
DEC	80	.	.	.	.	.
STANDRD PLATE CNT MF (COUNT/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)		
JAN	.	6 <=>	.	5 <=>	.	22
FEB	.	11	.	9 <=>	.	14
MAR	.	32	.	16	.	8 <=>
APR	.	28	.	20	.	25
MAY	.	48	.	35	.	42
JUN	.	14	.	9 <=>	.	13
JUL	.	89	.	14	.	860
AUG	.	23	.	310	.	!LA
SEP	.	2 <=>	.	.	.	1700
OCT	.	9 <=>	.	4 <=>	.	45
NOV	.	2 <=>	.	0 <=>	.	22
DEC	.	3 <=>	.	1 <=>	.	13
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)		
JAN	500	.	.	.	.	.
FEB	1400	.	.	.	.	.
MAR	1420	.	.	.	.	.
APR	4600	.	.	.	.	.
MAY	29000	.	.	.	.	.
JUN	200 <=>	.	.	.	.	.
JUL	500 <=>	.	.	.	.	.
AUG	700 <=>	.	.	.	.	.
SEP	40 <=>	.	.	.	.	.
OCT	15000 >	.	.	.	.	.
NOV	1220	.	.	.	.	.
DEC	3200	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A		
JAN	4300	.	.	.	.	.
FEB	6400	.	.	.	.	.
MAR	4240	.	.	.	.	.
APR	21000	.	.	.	.	.
MAY	00000 >	.	.	.	.	.
JUN	35000	.	.	.	.	.
JUL	41000	.	.	.	.	.
AUG	40000 >	.	.	.	.	.
SEP	48000 >	.	.	.	.	.
OCT	40000 >	.	.	.	.	.
NOV	48000 >	.	.	.	.	.
DEC	12000	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	.400	.100	.050	.100	.300
FEB	.	1.000	.400	.400	.500	.800
MAR	.	.700	.400	.600	.400	.600
APR	.	.600	.300	.400	.400	.500
MAY	.	.800	.300	.300	.200	.400
JUN	.	.400	.100	.300	.300	.200
JUL	.	.500	.300	.400	.300	.400
AUG	.	.500	.300	.300	.200	.300
SEP	.	.360	.400	.500	.300	.400
OCT	.	.500	.300	.300	.300	.300
NOV	.	.400	.200	.300	.200	.200
DEC	.	.400	.200	.400	.200	.300
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	.400	.100	.350	.100	.100
FEB	.	.	.100	.200	.100	.100
MAR	.	.200	.200	.100	.100	.100
APR	.	.300	.100	.200	.100	.100
MAY	.	.100	.000	.100	.100	.100
JUN	.	.400	.100	.100	.000	.200
JUL	.	.100	.000	.000	.000	.000
AUG	.	.500	.100	.200	.100	.100
SEP	.	.500	.200	.200	.100	.100
OCT	.	.600	.100	.200	.100	.200
NOV	.	.400	.100	.100	.100	.200
DEC	.	.600	.100	.100	.100	.200
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	.800	.200	.400	.200	.400
FEB	.	1.000	.500	.600	.600	.900
MAR	.	.900	.600	.700	.500	.700
APR	.	.900	.400	.600	.500	.600
MAY	.	.900	.300	.400	.300	.500
JUN	.	.800	.200	.400	.300	.400
JUL	.	.600	.300	.400	.300	.400
AUG	.	1.000	.400	.500	.300	.400
SEP	.	.860	.600	.700	.400	.500
OCT	.	1.100	.400	.500	.400	.500
NOV	.	.800	.300	.400	.300	.400
DEC	.	1.000	.300	.500	.300	.500
FLD PH (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
JAN	7.700	7.000	7.100	6.900	7.300	7.300
FEB	7.500	7.100	6.800	7.000	7.100	7.100
MAR	7.500	7.100	6.900	7.000	7.100	6.900
APR	8.000	7.000	7.200	7.000	7.100	7.100
MAY	8.100	7.100	7.400	7.200	7.200	7.300
JUN	8.000	7.000	7.300	7.100	7.300	7.300
JUL	8.200	7.300	7.300	7.000	7.300	7.100
AUG	8.000	6.900	7.300	7.100	7.200	7.200
SEP	7.900	7.000	7.400	7.200	7.200	7.100
OCT	7.700	6.800	7.300	7.100	7.300	6.900
NOV	8.300	7.100	7.400	7.200	7.300	7.300
DEC	8.200	7.300	7.400	7.100	7.300	7.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A		GUIDELINE = 15 (A3)	
JAN	2.000	2.000	12.000	6.000	19.000	6.000
FEB	2.000	2.000	12.000	3.000	12.000	5.000
MAR	2.000	2.000	12.000	4.000	15.000	5.000
APR	5.000	4.000	12.000	4.000	13.000	5.000
MAY	16.000	16.000	20.000	16.000	16.000	10.000
JUN	18.000	18.000	20.000	17.000	15.000	13.000
JUL	22.000	22.000	18.000	21.000	19.000	17.000
AUG	24.000	24.000	20.000	22.000	21.000	19.000
SEP	22.000	22.000	22.000	18.000	21.000	20.000
OCT	13.000	14.000	18.000	16.000	19.000	17.000
NOV	8.000	8.000	13.000	9.000	18.000	12.000
DEC	5.000	5.000	18.000	6.000	18.000	10.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A		GUIDELINE = 1 (A1)	
JAN	4.000	.300	.600	.500	.320	.360
FEB	3.000	.360	.300	.460	.360	.380
MAR	3.200	.340	1.000	.800	.360	.360
APR	8.600	.480	.700	.600	.460	.420
MAY	7.600	.620	.800	.600	.500	.520
JUN	8.000	.460	.300	.400	.460	.380
JUL	3.600	.620	.800	.700	.500	.520
AUG	6.000	.230	.280	.400	.260	.240
SEP	2.800	.180	.500	.300	.280	.260
OCT	26.000	.200	.200	.300	.230	.280
NOV	6.200	.160	.300	.400	.240	.200
DEC	4.800	.360	.400	.300	.360	.320

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 30-500 (A3)	
JAN	293.500	247.200	247.900	247.400	250.900	247.300
FEB	203.300	158.900	159.500	159.700	152.600	158.300
MAR	198.000	157.100	154.100	152.400	150.000	153.300
APR	180.300	141.600	140.400	139.900	142.500	143.300
MAY	219.100	172.600	172.900	171.000	172.200	172.000
JUN	228.700	172.800	172.800	172.400	176.500	174.500
JUL	235.000	179.300	178.900	179.100	177.200	178.000
AUG	211.000	152.900	154.000	153.500	154.100	153.400
SEP	211.800	150.000	149.000	149.600	149.200	149.000
OCT	182.800	119.000	123.500	122.600	137.000	127.800
NOV	264.100	212.200	205.600	203.600	205.400	205.900
DEC	255.500	209.400	204.600	203.700	203.900	205.700
CALCIUM (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 100 (F2)	
JAN	103.700	102.100	104.000	105.300	103.100	102.200
FEB	71.000	66.800	67.800	67.600	63.800	66.600
MAR	69.450	66.700	60.510	65.210	62.510	64.240
APR	64.800	66.600	66.800	66.600	67.400	66.600
MAY	72.300	73.300	72.900	73.400	73.400	74.400
JUN	71.200	73.000	70.200	71.400	74.100	71.600
JUL	76.000	75.200	73.800	74.800	73.200	72.200
AUG	71.400	71.900	70.800	71.400	71.200	70.600
SEP	69.200	70.400	71.000	69.400	68.400	68.000
OCT	66.600	63.400	64.000	64.200	65.800	64,000
NOV	91.400	91.500	91.700	93.000	88.000	91.900
DEC	93.300	91.400	88.900	88.500	90.900	88.400
CHLORIDE (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 250 (A3)	
JAN	58.500	63.800	63.400	63.300	63.900	62.900
FEB	37.500	37.600	37.200	37.300	35.500	36.600
MAR	30.900	30.200	29.600	29.600	29.300	29.500
APR	29.000	31.900	31.800	31.700	33.200	32.400
MAY	22.400	28.500	28.500	28.600	31.200	29.200
JUN	22.100	28.400	28.500	28.500	28.900	28.400
JUL	21.600	28.500	28.300	28.400	27.000	26.900
AUG	28.900	38.800	38.600	38.200	39.200	38.700
SEP	37.900	48.300	48.800	48.500	50.000	49.100
OCT	35.200	44.400	43.300	44.000	47.200	43.900
NOV	39.300	36.000	35.300	35.600	35.900	35.200
DEC	30.000	35.600	36.300	35.900	35.500	36.100
COLOUR (HZU)			DET'N LIMIT = 0.5		GUIDELINE = 5 (A3)	
JAN	30.500	10.000	11.000	10.500	11.500	11.000
FEB	33.500	8.500	9.000	8.500	9.500	9.000
MAR	31.500	8.500	9.000	8.000	9.000	8.500
APR	39.000	7.000	7.500	7.500	8.000	7.000
MAY	69.500	11.000	13.000	12.500	12.000	11.500
JUN	55.000	8.500	8.000	8.000	9.500	8.500
JUL	60.500	14.000	14.000	14.000	15.000	14.000
AUG	49.000	9.500	11.000	10.500	11.500	10.500
SEP	36.000	6.500	7.000	7.000	8.000	7.000
OCT	28.500	6.000	7.000	6.000	6.000	6.500
NOV	41.000	11.000	9.500	11.500	12.000	11.500
DEC	37.000	9.000	10.000	9.000	11.000	10.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.		GUIDELINE = 400 (F2)	
JAN	915	935	938	935	937	934
FEB	601	601	596	599	574	590
MAR	561	557	546	547	539	548
APR	517	561	561	559	576	575
MAY	537	581	582	580	597	585
JUN	543	579	580	579	582	580
JUL	537	551	553	553	540	542
AUG	541	571	573	570	576	571
SEP	590	619	617	617	620	617
OCT	568	571	584	582	606	587
NOV	721	698	700	693	697	696
DEC	666	702	698	698	693	702
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100		GUIDELINE = 5.0 (A3)	
JAN	7.900	5.900	5.900	5.900	6.400	5.900
FEB	7.000	4.400	4.400	4.500	4.500	4.500
MAR	7.600	4.900	4.600	4.600	4.700	4.700
APR	8.300	4.500	4.500	4.600	4.600	4.500
MAY	13.100	8.300	8.000	8.100	6.900	7.100
JUN	12.000	6.600	6.600	6.500	7.200	6.400
JUL	13.700	8.600	8.700	8.900	8.400	8.600
AUG	12.200	7.400	7.200	7.200	7.100	7.000
SEP	10.800	6.500	6.400	6.400	6.200	6.400
OCT	9.100	5.200	5.200	5.100	5.800	5.500
NOV	9.900	6.500	6.400	6.500	6.500	6.400
DEC	8.500	5.100	5.300	5.300	5.200	5.100
FLUORIDE (MG/L)			DET'N LIMIT = 0.01		GUIDELINE = 2.4 (A1)	
JAN	.140	.080	.060	.080	.080	.080
FEB	.100	.040 <T	.040 <T	.040 <T	.040 <T	.040 <T
MAR	.100	.040 <T	.040 <T	.040 <T	.040 <T	.040 <T
APR	.100	.040 <T	.040 <T	.040 <T	.040 <T	.040 <T
MAY	.140	.080	.080	.080	.080	.080
JUN	.140	.080	.080	.100	.080	.080
JUL	.140	.100	.080	.100	.100	.080
AUG	.160	.100	.080	.100	.100	.100
SEP	.140	.080	.080	.080	.080	.080
OCT	.160	.080	.080	.080	.080	.080
NOV	.160	.100	.100	.100	.100	.100
DEC	.140	.140	.080	.080	.080	.080

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
HARDNESS (MG/L)			DET'N LIMIT = 0.5		GUIDELINE = 80-100 (A4)	
JAN	410.400	405.000	409.600	413.700	405.800	403.700
FEB	266.000	251.000	251.000	252.000	237.000	248.000
MAR	254.000	244.000	226.000	239.000	233.000	236.000
APR	231.000	242.000	243.000	243.000	248.000	244.000
MAY	255.700	262.000	261.500	261.700	266.500	265.500
JUN	264.400	270.500	261.800	266.200	273.600	266.000
JUL	279.000	273.000	269.000	272.000	264.000	265.000
AUG	258.500	261.300	258.500	261.600	260.600	259.400
SEP	257.000	261.000	262.000	259.000	257.000	254.000
OCT	240.000	234.000	236.000	236.000	246.000	236.000
NOV	337.800	323.500	323.500	327.100	314.800	322.600
DEC	329.300	331.700	323.900	322.400	327.400	321.900
IONCAL (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
JAN	3.613	1.892	1.610	.666	2.929	2.105
FEB	.105	.385	.193	.536	1.535	.175
MAR	1.073	1.981	3.558	1.664	.178	.834
APR	.906	2.074	2.185	2.010	1.952	3.550
MAY	.518	1.813	1.845	1.315	2.204	1.491
JUN	.900	.383	3.538	1.762	.257	2.139
JUL	3.688	2.254	.990	1.981	.684	1.170
AUG	3.855	3.821	2.831	3.764	2.631	2.976
SEP	1.066	.245	.619	.425	1.140	2.462
OCT	.928	.228	.025	.453	.395	.279
NOV	2.712	4.200	1.896	.307	4.650	2.341
DEC	2.239	1.763	3.099	2.317	1.723	.157
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A	
JAN	1.537	1.234	1.234	1.268	1.405	1.325
FEB	1.019	.505	.864	.913	.850	.933
MAR	.962	.534	.444	.522	.647	.528
APR	1.015	.678	.635	.733	.734	.732
MAY	1.095	.803	.852	.650	.931	.858
JUN	1.167	.422	.545	.522	.688	.578
JUL	1.357	1.044	.975	.921	.998	.964
AUG	1.203	.923	.870	.892	.972	.957
SEP	1.086	.561	.552	.664	.666	.683
OCT	1.118	.460	.779	.817	.884	.853
NOV	1.465	1.182	1.119	1.191	1.241	1.211
DEC	1.373	1.036	.914	.920	1.012	.983
MAGNESIUM (MG/L)			DET'N LIMIT = 0.10		GUIDELINE = 30 (F2)	
JAN	36.800	36.450	36.400	36.600	36.050	36.050
FEB	21.700	20.300	19.900	20.300	18.800	19.900
MAR	19.500	18.800	18.150	18.450	18.600	18.250
APR	16.700	18.400	18.400	18.600	19.500	18.800
MAY	18.300	19.200	19.300	19.050	20.250	19.400
JUN	21.050	21.450	21.000	21.350	21.550	21.200
JUL	21.600	20.700	20.500	20.700	19.700	20.600
AUG	19.500	19.850	19.800	20.250	20.150	20.200
SEP	20.500	20.700	20.600	20.800	21.000	20.500
OCT	17.800	18.300	18.600	18.300	19.900	18.500
NOV	26.600	23.100	22.950	23.050	23.100	22.600
DEC	23.400	25.150	24.800	24.650	24.400	24.600

TABLE 5
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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
JAN	34.800	37.300	37.500	37.100	37.700	37.000
FEB	23.800	25.800	26.200	25.200	24.600	25.600
MAR	21.800	22.900	21.900	22.300	21.400	22.900
APR	16.400	17.200	16.800	16.800	17.800	17.000
MAY	14.400	16.100	16.200	16.000	17.800	16.400
JUN	15.200	15.000	15.200	14.900	15.500	15.100
JUL	14.000	13.400	13.600	13.400	12.800	13.000
AUG	18.900	18.400	19.100	18.700	19.400	18.800
SEP	25.200	25.600	25.200	25.400	26.000	25.000
OCT	21.800	22.600	22.800	22.400	24.800	23.800
NOV	23.300	18.400	18.800	18.500	18.300	18.200
DEC	20.900	22.900	22.600	22.600	21.800	22.400
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
JAN	.082	BDL	.002 <T	.004 <T	.026	.002 <T
FEB	.196	.180	.208	.182	.190	.178
MAR	.170	.134	.156	.140	.148	.138
APR	.304	.162	.168	.168	.160	.160
MAY	.498	.234	.220	.236	.012	.050
JUN	.022	BDL	BDL	BDL	.002 <T	BDL
JUL	.024	BDL	BDL	BDL	BDL	BDL
AUG	.112	.010	.024	.018	.016	.020
SEP	BDL	BDL	.004 <T	BDL	.010	.002 <T
OCT	.104	.008 <T	.014	.012	.026	.008 <T
NOV	.002 <T	.006 <T	.004 <T	BDL	.006 <T	BDL
DEC	.012	.010	.012	.006 <T	.014	.010
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
JAN	.055	.002 <T	.002 <T	.002 <T	.002 <T	.002 <T
FEB	.021	.004 <T	.002 <T	.004 <T	.007	.004 <T
MAR	.014	.004 <T	.003 <T	.002 <T	.004 <T	.003 <T
APR	.022	.003 <T	.001 <T	.001 <T	.003 <T	.002 <T
MAY	.045	.014	.010	.008	.004 <T	.005
JUN	.017	.001 <T	.001 <T	.001 <T	.002 <T	.001 <T
JUL	.037	.006	.005	.006	.006	.006
AUG	.043	.003 <T	.002 <T	.002 <T	.002 <T	.002 <T
SEP	.003 <T	.004 <T	.004 <T	.009	.010	.009
OCT	.054	.002 <T	.002 <T	.003 <T	.004 <T	.001 <T
NOV	.014	.002 <T	.002 <T	.001 <T	.002 <T	.001 <T
DEC	.019	.006	.006	.005	.006	.006
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
JAN	1.650	1.750	1.780	1.770	1.800	1.800
FEB	1.430	1.460	1.470	1.470	1.490	1.480
MAR	1.040	1.070	1.080	1.070	1.080	1.080
APR	.920	.985	.970	.980	1.030	1.010
MAY	.650	.770	.765	.780	.880	.805
JUN	.560	.600	.620	.605	.635	.615
JUL	.860	.710	.710	.720	.645	.645
AUG	.435	.305	.285	.295	.270	.280
SEP	.375	.175	.180	.185	.190	.185
OCT	2.770	1.820	1.780	1.810	.840	1.380
NOV	1.700	1.850	1.850	1.840	1.890	1.850
DEC	2.030	2.080	2.100	2.060	2.080	2.140

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.780	.520	.520	.510	.610	.530
FEB	.850	.640	.650	.670	.680	.650
MAR	.830	.540	.570	.540	.560	.560
APR	1.130	.670	.660	.670	.670	.640
MAY	1.920	.840	.870	.890	.620	.710
JUN	.940	.520	.500	.520	.560	.510
JUL	1.070	.730	.740	.760	.750	.710
AUG	.990	.540	.520	.540	.590	.560
SEP	.890	.490	.350	.410	.440	.500
OCT	.425	.190	.190	.230	.490	.520
NOV	.860	.580	.570	.550	.580	.540
DEC	.730	.420	.440	.410	.660	.470
PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	8.540	8.320	8.310	8.340	8.480	8.410
FEB	8.330	7.950	8.300	8.350	8.330	8.380
MAR	8.290	7.980	7.940	7.990	8.140	8.000
APR	8.410	8.170	8.130	8.230	8.220	8.220
MAY	8.360	8.170	8.220	8.020	8.300	8.220
JUN	8.420	7.790	7.930	7.900	8.040	7.950
JUL	8.570	8.380	8.320	8.260	8.350	8.320
AUG	8.490	8.350	8.300	8.320	8.400	8.390
SEP	8.390	8.010	8.000	8.120	8.130	8.150
OCT	8.500	8.050	8.350	8.390	8.400	8.410
NOV	8.560	8.370	8.320	8.390	8.460	8.410
DEC	8.470	8.230	8.130	8.140	8.220	8.200
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005	GUIDELINE = N/A		
JAN	.026	.000 <T	.	.	.	.
FEB	.045	.001 <T	.	.	.	.
MAR	.033	.001 <T	.	.	.	.
APR	.065	.001 <T	.	.	.	.
MAY	.193	.005	.	.	.	.
JUN	.007	.001 <T	.	.	.	.
JUL	.016	.000 <T	.	.	.	.
AUG	.038	BDL	.	.	.	.
SEP	.075	BDL	.	.	.	.
OCT	.185	.002	.	.	.	.
NOV	.016	.002 <T	.	.	.	.
DEC	.011	.000 <T	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)		
JAN	.045	.004 <T	.	.	.	.
FEB	.068	.008 <T	.	.	.	.
MAR	.058	.004 <T	.	.	.	.
APR	.123	.008 <T	.	.	.	.
MAY	.255	.017	.	.	.	.
JUN	.066	.005 <T	.	.	.	.
JUL	.063	.010	.	.	.	.
AUG	.098	.010	.	.	.	.
SEP	.109	.008 <T	.	.	.	.
OCT	.240	.002 <T	.	.	.	.
NOV	.108	.067	.	.	.	.
DEC	.045	.003 <T	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
JAN	117.070	145.730	149.040	148.330	148.460	145.650
FEB	55.720	87.490	87.410	88.150	83.780	86.170
MAR	51.020	81.570	80.660	81.670	80.640	81.290
APR	43.330	91.840	93.140	93.550	96.380	94.600
MAY	35.870	84.210	83.610	83.610	88.990	86.260
JUN	36.760	85.780	86.390	85.500	83.620	84.970
JUL	28.360	70.400	70.930	70.540	69.170	68.770
AUG	34.070	78.140	78.830	79.570	81.360	79.320
SEP	46.690	93.230	92.590	92.900	93.070	93.300
OCT	45.650	91.480	91.110	90.670	90.960	90.040
NOV	70.270	104.830	104.810	101.500	103.900	103.970
DEC	58.960	103.570	94.760	97.420	102.790	102.740
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
JAN	9.400	.430	.540	.780	.540	.730
FEB	7.600	.410	1.110	.830	1.180	1.160
MAR	10.000	.860	.980	.990	1.000	.880
APR	16.000	.830	.720	.720	.940	.730
MAY	19.000	1.600	1.600	1.600	1.400	1.740
JUN	19.000	.970	.910	.860	.950	1.050
JUL	7.600	1.200	1.200	1.200	1.500	1.200
AUG	13.000	.500	.980	.560	.530	.370
SEP	6.600	.410	.780	.440	.390	.510
OCT	52.000	.340	.500	.470	.240 <T	.500
NOV	14.600	.420	.500	.430	.430	.490
DEC	15.500	.570	.570	.570	.750	.720

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
JAN	190.000	68.000	52.000	65.000	57.000	58.000
FEB	13.000	86.000	100.000	110.000	61.000	62.000
MAR	170.000	150.000	100.000	120.000	120.000	130.000
APR	290.000	140.000	130.000	150.000	180.000	160.000
MAY	300.000	230.000	190.000	210.000	180.000	200.000
JUN	270.000	120.000	110.000	110.000	140.000	140.000
JUL	170.000	450.000	420.000	410.000	330.000	350.000
AUG	460.000	110.000	65.000	68.000	70.000	78.000
SEP	140.000	50.000	45.000	47.000	60.000	55.000
OCT	.420 <T	52.000	43.000	42.000	49.000	47.000
NOV	270.000	53.000	49.000	48.000	50.000	50.000
DEC	230.000	120.000	120.000	120.000	210.000	160.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
JAN	.590 <T	.320 <T	.300 <T	.290 <T	.370 <T	.350 <T
FEB	.120 <T	BDL	BDL	.140 <T	.110 <T	BDL
MAR	.250 <T	.120 <T	.210 <T	BDL	.190 <T	BDL
APR	.350 <T	.290 <T	.370 <T	.190 <T	.230 <T	.430 <T
MAY	.870 <T	.440 <T	.380 <T	.310 <T	.610 <T	.390 <T
JUN	.610 <T	BDL	BDL	BDL	.180 <T	BDL
JUL	.350 <T	BDL	.370 <T	.440 <T	.290 <T	.180 <T
AUG	1.300	.420 <T	.460 <T	.480 <T	.380 <T	.540 <T
SEP	.900 <T	.260 <T	BDL	.270 <T	BDL	BDL
OCT	.730 <T	.380 <T	.330 <T	.350 <T	.380 <T	.300 <T
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
JAN	120.000	81.000	81.000	78.000	82.000	78.000
FEB	64.000	47.000	49.000	47.000	46.000	46.000
MAR	59.000	42.000	43.000	41.000	42.000	41.000
APR	53.000	46.000	46.000	49.000	50.000	48.000
MAY	56.000	47.000	47.000	48.000	48.000	47.000
JUN	47.000	43.000	43.000	41.000	45.000	44.000
JUL	51.000	43.000	43.000	41.000	42.000	47.000
AUG	54.000	56.000	51.000	51.000	48.000	53.000
SEP	53.000	49.000	50.000	49.000	53.000	52.000
OCT	80.000	63.000	61.000	59.000	60.000	59.000
NOV	75.000	49.000	47.000	47.000	47.000	47.000
DEC	64.000	42.000	43.000	41.000	44.000	43.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
JAN	55.000	65.000	69.000	67.000	64.000	57.000
FEB	47.000	36.000	37.000	34.000	42.000	34.000
MAR	34.000	21.000	33.000	20.000 <T	36.000	37.000
APR	19.000 <T	24.000	23.000	26.000	28.000	27.000
MAY	130.000	44.000	110.000	120.000	110.000	120.000
JUN	94.000	83.000	90.000	82.000	31.000	32.000
JUL	44.000	44.000	43.000	43.000	40.000	44.000
AUG	63.000	61.000	61.000	49.000	60.000	51.000
SEP	65.000	67.000	60.000	66.000	74.000	71.000
OCT	41.000	47.000	47.000	46.000	52.000	46.000
NOV	42.000	45.000	45.000	45.000	42.000	43.000
DEC	31.000	32.000	35.000	35.000	34.000	34.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
JAN	BDL	.100 <T	BDL	.110 <T	BDL	.080 <T
FEB	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	BDL	BDL	BDL
MAY	.190 <T	BDL	.190 <T	.180 <T	.110 <T	.140 <T
JUN	.130 <T	.110 <T	.110 <T	.070 <T	BDL	BDL
JUL	.070 <T	.080 <T	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL
SEP	.070 <T	BDL	.060 <T	BDL	.080 <T	.080 <T
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	.060 <T	.060 <T	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	BDL	.070 <T	.100 <T	.070 <T
FEB	BDL	.110 <T	BDL	BDL	.090 <T	BDL
MAR	BDL	BDL	.140 <T	BDL	.080 <T	BDL
APR	.080 <T	.060 <T	BDL	.060 <T	.070 <T	BDL
MAY	BDL	BDL	BDL	BDL	.140 <T	BDL
JUN	BDL	BDL	BDL	BDL	.070 <T	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	.170 <T	BDL	.410 <T	BDL
OCT	.060 <T	.060 <T	.070 <T	.060 <T	.080 <T	BDL
NOV	.060 <T	.060 <T	BDL	BDL	.100 <T	BDL
DEC	BDL	.070 <T	.070 <T	.060 <T	.110 <T	BDL
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.230 <T	.060 <T	.110 <T	.150 <T	.140 <T	.150 <T
FEB	BDL	.100 <T	.150 <T	.380 <T	.080 <T	.070 <T
MAR	.270 <T	.200 <T	.160 <T	.160 <T	.210 <T	.170 <T
APR	.380 <T	.110 <T	.140 <T	.160 <T	.180 <T	.170 <T
MAY	.580 <T	.340 <T	.270 <T	.270 <T	.310 <T	.200 <T
JUN	.200 <T	.070 <T	.060 <T	.090 <T	.240 <T	.260 <T
JUL	.380 <T	.230 <T	.470 <T	.190 <T	.230 <T	.220 <T
AUG	.170 <T	.050 <T	BDL	.080 <T	.060 <T	.050 <T
SEP	.130 <T	.100 <T	.190 <T	.120 <T	.100 <T	.180 <T
OCT	.740 <T	.160 <T	.200 <T	.150 <T	.190 <T	.150 <T
NOV	.230 <T	BDL	.050 <T	.050 <T	.040 <T	.030 <T
DEC	.340 <T	.190 <T	.130 <T	.180 <T	.210 <T	.190 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
JAN	.730 <T	3.200 <T	4.800 <T	4.600 <T	3.000 <T	1.500 <T
FEB	2.300 <T	1.800 <T	2.000 <T	1.800 <T	2.500 <T	1.600 <T
MAR	2.600 <T	.890 <T	3.200 <T	.900 <T	3.400 <T	3.800 <T
APR	.900 <T	1.100 <T	1.100 <T	.680 <T	.810 <T	.550 <T
MAY	7.300	1.400 <T	5.300	5.800	5.100	5.600
JUN	4.200 <T	4.800 <T	3.300 <T	3.200 <T	BDL	BDL
JUL	4.000 <T	3.800 <T	3.600 <T	3.600 <T	3.200 <T	3.500 <T
AUG	5.000 <T	4.300 <T	4.200 <T	2.200 <T	3.600 <T	2.300 <T
SEP	3.800 <T	3.500 <T	2.500 <T	3.300 <T	4.100 <T	3.500 <T
OCT	2.400 <T	BDL	BDL	BDL	BDL	BDL
NOV	3.600 <T	4.000 <T	4.200 <T	3.800 <T	2.700 <T	3.200 <T
DEC	.780 <T	BDL	BDL	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
COPPER (UG/L)			DET'N LIMIT = 0.50		GUIDELINE = 1000 (A3)	
JAN	2.200 <T	2.600 <T	14.000	7.600	140.000	14.000
FEB	1.700 <T	1.900 <T	84.000	9.900	110.000	33.000
MAR	1.800 <T	1.800 <T	1100.000	18.000	140.000	11.000
APR	2.100 <T	1.700 <T	35.000	7.600	100.000	8.900
MAY	2.400 <T	2.300 <T	220.000	7.800	110.000	9.800
JUN	2.100 <T	1.900 <T	4.800 <T	5.200	110.000	8.900
JUL	1.900 <T	2.000 <T	5.200	5.600	120.000	11.000
AUG	2.000 <T	2.300 <T	24.000	9.300	150.000	22.000
SEP	1.800 <T	2.200 <T	620.000	8.300	100.000	14.000
OCT	2.700 <T	3.100 <T	130.000	7.300	98.000	11.000
NOV	2.000 <T	1.800 <T	24.000	6.600	100.000	7.200
DEC	2.200 <T	1.800 <T	190.000	7.600	150.000	9.500
IRON (UG/L)			DET'N LIMIT = 6.00		GUIDELINE = 300 (A3)	
JAN	210.000	9.700 <T	BDL	BDL	9.800 <T	12.000 <T
FEB	6.400 <T	BDL	BDL	BDL	BDL	BDL
MAR	230.000	8.900 <T	BDL	9.100 <T	15.000 <T	16.000 <T
APR	460.000	7.100 <T	BDL	BDL	BDL	BDL
MAY	410.000	17.000 <T	11.000 <T	17.000 <T	17.000 <T	26.000 <T
JUN	330.000	BDL	BDL	BDL	15.000 <T	21.000 <T
JUL	220.000	15.000 <T	16.000 <T	20.000 <T	20.000 <T	24.000 <T
AUG	340.000	7.300 <T	BDL	9.300 <T	35.000 <T	20.000 <T
SEP	150.000	BDL	BDL	BDL	15.000 <T	19.000 <T
OCT	880.000	20.000 <T	6.800 <T	BDL	23.000 <T	27.000 <T
NOV	380.000	BDL	BDL	BDL	12.000 <T	7.300 <T
DEC	380.000	BDL	22.000 <T	BDL	15.000 <T	17.000 <T
MERCURY (UG/L)			DET'N LIMIT = 0.02		GUIDELINE = 1 (A1)	
JAN	.020 <T	.020 <T	.	.	.	.
FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	.	.	.	.	.
JUL	BDL	.040 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	BDL	.060 <T	.	.	.	.
MANGANESE (UG/L)			DET'N LIMIT = 0.05		GUIDELINE = 50 (A3)	
JAN	50.000	37.000	21.000	29.000	30.000	29.000
FEB	.210 <T	28.000	30.000	31.000	29.000	29.000
MAR	35.000	25.000	25.000	27.000	25.000	25.000
APR	64.000	47.000	46.000	45.000	46.000	45.000
MAY	74.000	24.000	21.000	23.000	18.000	20.000
JUN	44.000	12.000	11.000	10.000	10.000	10.000
JUL	43.000	11.000	11.000	11.000	15.000	14.000
AUG	47.000	31.000	14.000	15.000	11.000	13.000
SEP	71.000	6.400	6.800	5.500	6.300	5.600
OCT	67.000	8.500	6.600	6.300	6.900	6.600
NOV	34.000	16.000	12.000	13.000	13.000	12.000
DEC	26.000	9.300	9.000	6.100	10.000	8.400

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	6.200	6.600	6.400	6.500	6.200	6.700
FEB	3.700	3.000	2.700	2.800	2.800	3.100
MAR	2.200	2.600	2.200	2.100	1.900	2.100
APR	1.500	2.500	2.600	2.200	2.300	2.300
MAY	1.700	3.000	2.700	3.300	2.900	2.700
JUN	1.400	1.900	1.900	1.700	2.100	2.100
JUL	1.100	1.200	1.200	1.300	1.400	1.100
AUG	1.500	1.900	1.800	2.100	2.000	1.900
SEP	2.700	2.600	2.900	2.600	2.900	2.800
OCT	1.800	3.700	3.700	3.700	3.300	3.500
NOV	3.200	2.200	2.200	2.100	2.000	1.900
DEC	1.400	1.900	2.000	1.900	1.800	1.800
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
JAN	BDL	.230 <T	.600 <T	.210 <T	3.100	BDL
FEB	BDL	BDL	BDL	BDL	7.100	BDL
MAR	BDL	BDL	6.000	.360 <T	2.000 <T	BDL
APR	BDL	BDL	BDL	BDL	2.600	.370 <T
MAY	1.300 <T	1.400 <T	1.900 <T	1.100 <T	4.100	1.100 <T
JUN	BDL	2.000 <T	.270 <T	BDL	1.000 <T	BDL
JUL	BDL	BDL	.750 <T	1.400 <T	3.000	2.100
AUG	1.300 <T	.920 <T	1.400 <T	1.100 <T	3.900	.390 <T
SEP	BDL	.790 <T	22.000	BDL	.970 <T	BDL
OCT	4.000	3.200	3.500	2.800	6.300	2.300
NOV	BDL	BDL	BDL	BDL	1.500 <T	BDL
DEC	.610 <T	.730 <T	2.400	1.300 <T	4.100	.880 <T
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
JAN	.250 <T	.120 <T	1.800	.780	3.900	.390 <T
FEB	BDL	.060 <T	5.300	1.100	.880	.380 <T
MAR	.150 <T	.160 <T	21.000	1.100	2.800	.350 <T
APR	.390 <T	.260 <T	2.700	.800	3.100	.270 <T
MAY	.430 <T	.400 <T	8.100	.700	3.100	.370 <T
JUN	.410 <T	.630	.410 <T	.880	2.800	.350 <T
JUL	.210 <T	.330 <T	.440 <T	.600	4.600	.540
AUG	.370 <T	.710	2.400	.910	4.300	1.000
SEP	.220 <T	.540	24.000	.880	4.100	.800
OCT	1.100	.910	6.500	.750	3.400	.560
NOV	.230 <T	.260 <T	1.400	.540	3.500	.360 <T
DEC	.260 <T	.210 <T	5.500	.470 <T	4.300	.670
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
JAN	.280 <T	.360 <T	.450 <T	.370 <T	.400 <T	.330 <T
FEB	.390 <T	.560	.600	1.200	.390 <T	.430 <T
MAR	.310 <T	.380 <T	.510	.430 <T	.420 <T	.380 <T
APR	.230 <T	.370 <T	.320 <T	.510	.450 <T	.460 <T
MAY	.240 <T	.480 <T	.560	.540	.390 <T	.440 <T
JUN	.340 <T	.320 <T	.370 <T	.410 <T	.540	.570
JUL	.360 <T	.460 <T	.830	.550	.450 <T	.510
AUG	.280 <T	.350 <T	.540	.570	.470 <T	.550
SEP	.350 <T	.360 <T	.650	.440 <T	.430 <T	.350 <T
OCT	.260 <T	.400 <T	.640	.490 <T	.540	.420 <T
NOV	.300 <T	.420 <T	.510	.380 <T	.480 <T	.460 <T
DEC	.250 <T	.380 <T	.470 <T	.330 <T	.310 <T	.370 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
JAN	1.800 <T	2.000 <T	2.700 <T	2.400 <T	2.400 <T	2.000 <T
FEB	BDL	1.400 <T	1.200 <T	1.100 <T	1.700 <T	BDL
MAR	BDL	BDL	1.100 <T	1.100 <T	BDL	BDL
APR	BDL	BDL	BDL	BDL	1.300 <T	BDL
MAY	1.700 <T	1.700 <T	1.100 <T	BDL	2.300 <T	2.000 <T
JUN	BDL	BDL	BDL	1.900 <T	1.300 <T	BDL
JUL	1.400 <T	1.400 <T	1.400 <T	1.800 <T	1.500 <T	BDL
AUG	1.300 <T	2.500 <T	3.100 <T	2.800 <T	2.600 <T	2.100 <T
SEP	1.400 <T	2.700 <T	1.900 <T	1.900 <T	2.200 <T	1.700 <T
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	1.200 <T	1.400 <T	BDL	BDL	1.400 <T	1.300 <T
DEC	BDL	BDL	1.600 <T	1.300 <T	BDL	BDL
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
JAN	980.000	900.000	900.000	900.000	910.000	900.000
FEB	460.000	420.000	420.000	410.000	390.000	410.000
MAR	390.000	350.000	340.000	340.000	340.000	350.000
APR	450.000	450.000	460.000	440.000	460.000	440.000
MAY	470.000	480.000	480.000	480.000	500.000	480.000
JUN	470.000	450.000	440.000	430.000	490.000	510.000
JUL	580.000	550.000	530.000	520.000	520.000	510.000
AUG	560.000	510.000	510.000	510.000	520.000	540.000
SEP	700.000	660.000	660.000	660.000	670.000	680.000
OCT	690.000	720.000	710.000	700.000	740.000	690.000
NOV	640.000	620.000	610.000	610.000	590.000	600.000
DEC	670.000	610.000	610.000	620.000	630.000	640.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
JAN	19.000	10.000	11.000	11.000	10.000	11.000
FEB	18.000	16.000	17.000	16.000	15.000	16.000
MAR	21.000	9.900	10.000	9.600	9.100	9.400
APR	25.000	8.700	8.700	8.400	8.900	9.000
MAY	31.000	15.000	14.000	15.000	15.000	16.000
JUN	23.000	14.000	13.000	12.000	10.000	10.000
JUL	24.000	13.000	13.000	12.000	12.000	12.000
AUG	21.000	8.700	8.100	8.300	8.400	9.100
SEP	20.000	12.000	12.000	12.000	12.000	13.000
OCT	18.000	3.900 <T	4.000 <T	3.900 <T	3.900 <T	4.000 <T
NOV	24.000	9.500	9.400	9.200	9.000	9.300
DEC	25.000	11.000	10.000	10.000	11.000	11.000
THALLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 13 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
FEB	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	.070 <T	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUN	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
JAN	3.100	2.600	2.700	2.500	2.500	2.400
FEB	2.200	.800	.780	.710	.730	.760
MAR	1.300	.520	.420 <T	.450 <T	.410 <T	.420 <T
APR	1.300	.560	.560	.540	.590	.580
MAY	1.000	.740	.770	.740	.800	.780
JUN	1.500	.780	.730	.810	.780	.730
JUL	1.100	.720	.650	.730	.630	.610
AUG	1.100	.390 <T	.420 <T	.360 <T	.370 <T	.320 <T
SEP	1.200	.380 <T	.300 <T	.320 <T	.330 <T	.330 <T
OCT	2.000	.290 <T	.280 <T	.260 <T	.350 <T	.290 <T
NOV	2.200	1.500	1.400	1.500	1.400	1.400
DEC	2.300	1.500	1.500	1.500	1.500	1.600
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	1.400	3.600	3.300	3.400	3.600	3.400
FEB	.620	3.300	3.300	3.300	3.100	3.200
MAR	1.100	3.100	2.900	3.100	2.900	3.000
APR	2.000	3.900	3.700	3.500	3.700	3.700
MAY	2.200	3.200	2.900	3.100	3.000	3.100
JUN	2.100	2.900	2.900	2.600	3.300	3.300
JUL	2.800	4.200	4.200	4.000	4.100	4.100
AUG	3.500	3.900	3.700	3.900	4.100	3.800
SEP	2.800	3.800	3.600	3.800	4.000	3.900
OCT	3.800	3.500	3.500	3.300	3.700	3.500
NOV	1.500	1.200	1.200	1.200	1.300	1.200
DEC	1.300	.550	.680	.560	.760	.630
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
JAN	5.800	5.000	9.900	6.200	87.000	7.200
FEB	1.800 <T	2.100	19.000	5.800	89.000	18.000
MAR	5.900	6.500	300.000	6.100	91.000	5.500
APR	5.800	3.500	8.700	5.300	26.000	3.800
MAY	5.100	3.400	43.000	7.500	85.000	3.500
JUN	4.000	3.400	4.100	4.100	50.000	5.100
JUL	3.000	3.500	4.400	4.100	48.000	4.500
AUG	4.200	3.300	10.000	5.700	79.000	8.100
SEP	2.900	4.700	990.000	7.400	69.000	7.000
OCT	9.000	4.100	75.000	4.800	110.000	4.400
NOV	6.100	5.300	20.000	6.000	95.000	5.500
DEC	6.900	6.500	62.000	7.500	150.000	7.100

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)	
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	7.000 <T	.	7.000 <T	.	6.000 <T
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	!IS	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	.
AUG	BDL	!IS	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROPHENOLS						
246-TRICHLOROPHENOL (NG/L)			DET'N LIMIT = 20.0		GUIDELINE = 5000 (A1)	
JUN	BDL	BDL	.	.	.	.
NOV	BDL	80.000 <T	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PAH PHENANTHRENE (NG/L)			DET'N LIMIT = 10.	GUIDELINE = N/A		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	!QU	!QU	.	.	.	.
JUL	BDL	BDL	.	.	.	.
AUG	BDL	!IS	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	10.000 <T	.	BDL	.	10.000 <T
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 700 (G)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	!IS	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	1.000 <T	.	BDL	.	.
AUG	BDL	!IS	.	BDL	.	BDL
SEP	BDL	1.000 <T	.	BDL	.	1.000 <T
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
ENDOSULFAN 1 (NG/L)			DET'N LIMIT = 2.000	GUIDELINE = 74000 (D4)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	BDL	.	BDL	.	BDL
MAR	4.000 <T	4.000 <T	.	4.000 <T	.	4.000 <T
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	!IS	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	.
AUG	BDL	!IS	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	100.000 <T	BDL	.	.	.	.
JUL	680.000	560.000	.	.	.	.
AUG	810.000	!IS	.	.	.	.
SEP	880.000	780.000	.	.	.	.
OCT	1500.000	920.000	.	.	.	.
NOV	240.000 <T	200.000 <T	.	.	.	.
DEC	BDL	BDL	.	.	.	.
DESETHYLATRAZINE (NG/L)			DET'N LIMIT = 200.0	GUIDELINE = 60000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	230.000 <T	BDL	.	.	.	.
AUG	280.000 <T	!IS	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	590.000 <T	BDL	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SIMAZINE (NG/L)			DET'N LIMIT = 50.000		GUIDELINE = 10000 (A2)	
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	BDL	.	.	.	.
AUG	300.000 <T	!IS	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = .200	GUIDELINE = 2 (A4)		
JAN	3.800	3.800	.	.	.	.
FEB	1.600	1.800	.	.	.	.
MAR	3.600	1.400	.	.	.	.
APR	3.800	1.000	.	.	.	.
MAY	3.600	.800 <T	.	.	.	.
JUN	.400 <T	BDL	.	.	.	.
JUL	.600 <T	.400 <T	.	.	.	.
AUG	.400 <T	BDL	.	.	.	.
SEP	BDL	BDL	.	.	.	.
OCT	BDL	2.800	.	.	.	.
NOV	BDL	BDL	.	.	.	.
DEC	.800 <T	1.000	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	BDL	.100 <T	.	.050 <T	.	.050 <T
MAR	.050 <T	.150 <T	.	.100 <T	.	.100 <T
APR	BDL	.150 <T	.	.100 <T	.	.150 <T
MAY	BDL	.050 <T	.	.050 <T	.	.100 <T
JUN	BDL	.050 <T	.	BDL	.	.050 <T
JUL	BDL	.100 <T	.	.100 <T	.	.100 <T
AUG	BDL	BDL	.	BDL	.	.100 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	.050 <T	BDL	.	BDL	.	BDL
TOLUENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 24 (A3)		
JAN	BDL	.300 <T	.	.250 <T	.	.250 <T
FEB	.150 <T	.500 <T	.	.450 <T	.	.600
MAR	BDL	.100 <T	.	.100 <T	.	.100 <T
APR	BDL	.600	.	.500	.	.550
MAY	BDL	.100 <T	.	.100 <T	.	.100 <T
JUN	BDL	.100 <T	.	.050 <T	.	.100 <T
JUL	BDL	.100 <T	.	.100 <T	.	.100 <T
AUG	BDL	.100 <T	.	.100 <T	.	.100 <T
SEP	BDL	.050 <T	.	.050 <T	.	.050 <T
OCT	BDL	.100 <T	.	.100 <T	.	.100 <T
NOV	.	.100 <T	.	.100 <T	.	.100 <T
DEC	.150 <T	BDL	.	BDL	.	.050 <T
ETHYLBENZENE (UG/L)		DET'N LIMIT = 0.05		GUIDELINE = 2.4 (A3)		
JAN	BDL	.050 <T	.	.050 <T	.	.050 <T
FEB	.200 <T	.100 <T	.	.100 <T	.	.100 <T
MAR	.050 <T	.200 <T	.	.150 <T	.	.100 <T
APR	BDL	.200 <T	.	.100 <T	.	.200 <T
MAY	BDL	.150 <T	.	.150 <T	.	.200 <T
JUN	BDL	.150 <T	.	BDL	.	.100 <T
JUL	BDL	.050 <T	.	.100 <T	.	BDL
AUG	BDL	.050 <T	.	.300 <T	.	.150 <T
SEP	BDL	.100 <T	.	.150 <T	.	.150 <T
OCT	BDL	.100 <T	.	.050 <T	.	.050 <T
NOV	.	.100 <T	.	.100 <T	.	.050 <T
DEC	.050 <T	BDL	.	BDL	.	.100 <T
M-XYLENE (UG/L)		DET'N LIMIT = 0.10		GUIDELINE = 300 (A3*)		
JAN	BDL	.100 <T	.	.200 <T	.	.100 <T
FEB	.700 <T	.400 <T	.	.300 <T	.	.400 <T
MAR	BDL	.100 <T	.	.100 <T	.	BDL
APR	BDL	.100 <T	.	.100 <T	.	.100 <T
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	.100 <T	.	.100 <T
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	.100 <T	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	.100 <T	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)		
JAN	BDL	.100 <T	.	.100 <T	.	.100 <T
FEB	.350 <T	.100 <T	.	BDL	.	BDL
MAR	BDL	BDL	.	.050 <T	.	BDL
APR	BDL	.050 <T	.	.050 <T	.	.050 <T
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	.100 <T	.	.100 <T	.	.100 <T
SEP	BDL	.100 <T	.	.050 <T	.	.050 <T
OCT	BDL	.050 <T	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	.050 <T	BDL	.	BDL	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
JAN	BDL	.100 <T	.	.100 <T	.	.100 <T
FEB	.050 <T	.050 <T	.	BDL	.	BDL
MAR	BDL	.200 <T	.	.150 <T	.	.150 <T
APR	BDL	.200 <T	.	.150 <T	.	.200 <T
MAY	BDL	.150 <T	.	.150 <T	.	.250 <T
JUN	BDL	.200 <T	.	.050 <T	.	.150 <T
JUL	BDL	.100 <T	.	.150 <T	.	BDL
AUG	BDL	.050 <T	.	.500 <T	.	.250 <T
SEP	BDL	.050 <T	.	.150 <T	.	.200 <T
OCT	BDL	BDL	.	BDL	.	.100 <T
NOV	.	BDL	.	BDL	.	BDL
DEC	.050 <T	BDL	.	.050 <T	.	.100 <T
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	.400 <T	46.200	.	44.300	.	41.100
FEB	.100 <T	10.200	.	9.800	.	10.700
MAR	BDL	15.300	.	14.100	.	12.600
APR	.300 <T	17.500	.	17.300	.	16.400
MAY	.400 <T	46.900	.	49.900	.	70.700
JUN	1.800	150.900	.	155.700	.	144.500
JUL	2.000	216.800	.	214.900	.	195.000
AUG	1.500	215.000	.	183.000	.	193.000
SEP	2.200	195.200	.	187.300	.	180.500
OCT	1.600	147.000	.	145.200	.	141.800
NOV	.	88.300	.	83.200	.	83.900
DEC	.300 <T	74.500	.	73.500	.	67.900
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)		
JAN	BDL	BDL	.	BDL	.	BDL
FEB	.060 <T	.040 <T	.	BDL	.	.040 <T
MAR	.020 <T	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	.040 <T	.	.080 <T
MAY	BDL	BDL	.	BDL	.	.040 <T
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
TRICHLOROETHYLENE (UG/L) DET'N LIMIT = 0.10 GUIDELINE = 50 (A1)						
JAN	BDL	BDL	.	BDL	.	BDL
FEB	.200 <T	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
DICHLOROBROMOMETHANE (UG/L) DET'N LIMIT = 0.05 GUIDELINE = 350 (A1+)						
JAN	.100 <T	20.800	.	19.800	.	18.150
FEB	BDL	1.800	.	1.600	.	1.750
MAR	BDL	1.600	.	1.400	.	1.250
APR	BDL	2.000	.	2.000	.	1.900
MAY	.050 <T	4.850	.	5.250	.	7.550
JUN	.200 <T	10.750	.	11.050	.	10.650
JUL	.250 <T	16.300	.	16.500	.	14.650
AUG	.200 <T	28.900	.	25.350	.	27.600
SEP	.350 <T	28.900	.	28.150	.	27.700
OCT	.250 <T	19.700	.	19.700	.	20.550
NOV	.	9.850	.	9.350	.	9.250
DEC	.100 <T	10.400	.	10.200	.	9.650
CHLORODIBROMOMETHANE (UG/L) DET'N LIMIT = 0.10 GUIDELINE = 350 (A1+)						
JAN	BDL	5.100	.	4.900	.	4.500
FEB	BDL	.200 <T	.	.200 <T	.	.200 <T
MAR	BDL	.200 <T	.	.100 <T	.	.100 <T
APR	BDL	.200 <T	.	.200 <T	.	.200 <T
MAY	BDL	.300 <T	.	.400 <T	.	.500 <T
JUN	BDL	.500 <T	.	.500 <T	.	.500 <T
JUL	BDL	.700 <T	.	.800 <T	.	.600 <T
AUG	BDL	2.000	.	1.700	.	2.000
SEP	BDL	2.200	.	2.100	.	2.200
OCT	BDL	1.500	.	1.500	.	1.700
NOV	.	.500 <T	.	.600 <T	.	.500 <T
DEC	BDL	.600 <T	.	.600 <T	.	.600 <T
T-CHLOROETHYLENE (UG/L) DET'N LIMIT = 0.05 GUIDELINE = 5 (D1)						
JAN	BDL	BDL	.	BDL	.	BDL
FEB	.150 <T	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CASSELMAN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BROMOFORM (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)		
JAN	BDL	.200 <T	.	.400 <T	.	.200 <T
FEB	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
APR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
AUG	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	.	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)		
JAN	.550 <T	72.400	.	69.300	.	63.950
FEB	BDL	BDL	.	11.600	.	12.650
MAR	BDL	17.050	.	15.600	.	14.000
APR	BDL	19.700	.	19.500	.	18.500
MAY	BDL	52.050	.	55.550	.	78.750
JUN	2.000 <T	162.150	.	167.250	.	155.650
JUL	2.250 <T	233.750	.	232.200	.	210.250
AUG	1.650 <T	245.850	.	210.050	.	222.600
SEP	2.600 <T	226.300	.	217.550	.	210.400
OCT	1.800 <T	168.150	.	166.400	.	164.000
NOV	.	98.600	.	93.100	.	93.600
DEC	BDL	85.550	.	84.400	.	78.150

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedance,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date

sampling was initiated; size, length and material type (intake, discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data

documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.
USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)

Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)

Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.